MISCELLANEOUS QUESTIONS.

EDITED BY R. D. CARMICHAEL.

When it was necessary to make ready the manuscript for this issue our readers had not yet had time to reply to our first questions, proposed in the November number. It is believed that some replies to those questions may be inserted in the issue next following this one. In the meantime we have received two other interesting questions. They are printed here; and the attention of our readers is directed to them.

QUESTIONS.

3. In connection with the theory of the conduction of electricity through gases, one is led to the differential equation

$$y\frac{d^2y}{dx^2} + a\left(\frac{dy}{dx}\right)^2 + b\frac{dy}{dx} + cy + d = 0,$$

where a, b, c, d are constants. For unrestricted values of a, b, c, d the solution of this differential equation presents peculiar difficulties, the series solutions obtained by the customary methods having (apparently) too small a range of convergence to be satisfactory from the point of view of electrical theory. The general solution of this equation is wanted in case it can be found. If no general solution is obtained for unrestricted a, b, c, d, it is desirable to know special values of a, b, c, d or special relations among a, b, c, d which make it possible to find the general solution; and this solution is desired in each case.

We shall be glad to receive an answer to any part of this question in case a complete answer is not found.

4. In analytic geometry classes we teach about six formulas for the straight line and often we drill pupils in their use only with formal exercises. Mr. R. M. MATHEWS, of Riverside, California, proposes a collaboration through the MONTHLY by means of which a set of problems of interest in themselves shall be collected for these drill exercises. Our readers are requested to send to the editor of this department such problems, classified under headings suggesting the formula for which each problem is useful, the headings being as follows: two point form, slope point form, slope intercept form, two intercept form, normal form, general form.

As examples of the sort of problem desired we have the following, suggested by Mr. Mathews:

Two point form.—A linear relation connects degrees centigrade with degrees Fahrenheit. Find this relation if 50° F. = 10° C. and − 4° F. = − 20° C.

Slope intercept form.—The electrical resistance of annealed copper wire is 9.59 ohms per mil-foot at 0° C., from which point it increases with the temperature in the proportion of 403 per thousand. Express the resistance in terms of temperature centigrade.

NOTES AND NEWS.

UNDER THE DIRECTION OF FLORIAN CAJORI.

The winter meeting of the Chicago Section of the American Mathematical Society wil held at Chicago on December 26–27, 1913.

The October number of the *Popular Science Monthly* contains an article on the Fourth Dimension, by Professor SAMUEL M. BARTON, of the University of the South.

The firm of Gauthier-Villars is undertaking the publication of the complete works of the late HENRI POINCARÉ, under the direction of the Paris Academy of Sciences and the French Minister of Public Instruction.

H. Grassmann, of the University of Giessen, the second volume of whose *Projektive Géometrie* has just been brought out by Teubner, is a son of the former professor in the gymnasium at Stettin, who is celebrated as the founder of the Ausdehnungslehre.

The San Francisco section of the American Mathematical Society held a regular meeting on October 25 at Stanford University. The following names appeared on the program: Professors L. M. Hoskins, M. W. Haskell, W. C. Eells, G. A. Miller, W. A. Manning and Mr. B. A. Bernstein.

Mr. A. C. Johnson, formerly of Cincinnati, Ohio, has recently become principal of the high school at Hopedale, Mass.

Dr. N. J. LENNES, of the department of mathematics at Columbia University, has accepted the position of professor of mathematics at the University of Montana, where he succeeds Professor L. C. Plant, who goes to the Michigan Agricultural College as head of the department of mathematics there.

Owing to the important rôle that questions of psychology play at the present time in discussions of mathematical teaching, a booklet on *Psychologie und mathematischer Unterricht*, prepared by D. Katz, under the editorship of Professor FELIX KLEIN, will be of general interest.

On September 6, 1913, occurred the death of Professor LUCIAN AUGUSTUS WAIT, of Cornell University, at the age of 67 years. After graduating at Harvard in 1870, he served on the mathematical faculty of Cornell until 1910, when he became professor emeritus. He is well known as one of the authors of the Oliver Wait & Jones series of mathematical texts.

Professor CHARLES GREENE ROCKWOOD, of Princeton, died on July 2, 1913, at the age of 71 years. He was a Yale graduate. He began his career as a teacher of college mathematics at Bowdoin and Rutgers, and during 1877–1905 was professor of mathematics at Princeton. Since 1905 he was professor emeritus. His early teaching embraced also natural philosophy and astronomy. His wide scientific interests are evident from the large number of scientific societies of which he was a member. He took part in the Princeton eclipse expedition to Colorado in 1878 and was a contributor on seismology to the *American Journal of Science*.

Recommendations on the unification of mathematical notations are contained in Heft 17 issued by the German committee on the teaching of mathematics and science. The recommendations are reprinted in Schotten's *Zeitschrift* for September, 1913. It will be remembered that a report on the same subject was made by an American committee under the chairmanship of L. P. Jocelyn, of Ann Arbor.

Dr. ALEXANDER MACFARLANE, whose death was announced in the last number of the MONTHLY, wrote to one of the editors less than two weeks before his death with regard to the history of the exponential and logarithmic concepts which appeared in the MONTHLY. He expressed himself as follows: "These concepts play the leading parts in the higher developments of vector-analysis; therefore

it behooves every vector-analyst to make himself thoroughly familiar with the history."

Plans are being made to commemorate the seventh centenary of Roger Bacon's birth at Oxford in July, 1914, when a statue of Bacon will be unveiled, and addresses will be given by distinguished scholars. There will be issued a memorial volume of essays dealing with various aspects of Roger Bacon's work. It is also proposed to prepare an edition of Bacon's writings, including various MSS. not hitherto published. To secure funds for such an edition it is proposed to organize a Roger Bacon Society.

At the University of Michigan the following men have been appointed as instructors in mathematics: T. Fort, Ph.D. (Harvard) 1912, student at Göttingen, 1912–1913; L. J. Rouse, A.B. (Princeton) 1908, Scholar at Univ. of Pennsylvania, 1912–1913; C. H. Forsythe, A.M. (Illinois) 1910, graduate student at Cornell, Illinois, and Michigan; B. Libby, B.S. (Princeton) 1911, graduate student at Wisconsin, 1911–1913. At the October meeting of the Board of Regents Assistant Professor T. R. Running was promoted to a junior professorship in mathematics and Dr. Clyde E. Love, from an instructorship to an assistant professorship. Assistant Professor Peter Field was promoted to a junior professorship at a previous meeting. Mr. L. A. Hopkins is absent on leave, as Fellow in the University of Chicago, and Mr. Carl Coe as Scholar at Harvard University.

According to *Science*, W. H. YOUNG, professor of mathematics in Liverpool University, has been appointed professor of mathematics in the University of Calcutta, for the purpose of organizing there a new school of mathematics. As the duties of the post require his residence in India only from November till March, he will retain his professorship in Liverpool University.

In the *Annaes da academia polytechnica do Porto* (Volume VIII, 1913) Yoshio Mikami gives an account of a seventeenth century Portuguese scientist who went to Japan as a Christian missionary, but, to escape persecution by the Shogunate, was compelled to forsake his faith and render service to the authorities. He assumed a Japanese name. His real name is still unknown. In 1650 he translated into Japanese an astronomical treatise. Mikami concludes that Japanese scientists of the seventeenth century became acquainted with European astronomy not so much through the Chinese, as is sometimes believed, but mainly through direct contact with Europeans. In 1687 the Shogunate prohibited the importation into Japan of 38 works compiled in China from European sources, for the reason that they bore on "the accursed religion of Christianity." Among these treatises were a translation of Euclid, a treatise on arithmetic, and some works in astronomy and surveying.

The Annual Report of the Smithsonian Institution for 1912, published in 1913, contains the address on "Molecular theories and mathematics," delivered by Professor ÉMIL BOREL, of Paris, on the occasion of the inauguration of the Rice Institute, October 10 to 12, 1912. This volume contains three other articles of special mathematical interest, as follows: "The connection between the ether and

matter," by HENRI POINCARÉ; "Modern mathematical research," by G. A. MILLER; and "HENRI POINCARÉ, his scientific work, his philosophy," by CHARLES NORDMANN.

The central committee of the International Commission on the Teaching of Mathematics announces a Congress of the Commission to be held at Paris, April 6 to 8, 1914. The details of the meeting will be announced later. The arrangements at Paris were in charge of Professor Carlo Bourlet, who died on the twelfth of August, from the effects of an accident, and consequently the completion of the program is delayed. At present, it can be definitely announced that two public sessions will be devoted to the consideration of reports on the following two questions:

A. The results obtained in the introduction of the differential and the integral calculus into secondary instruction. General Reporter, PROFESSOR E. BEKE, Budapest.

B. The place and function of mathematics in advanced technological instruction. General Reporter, PROFESSOR P. STAECKEL, Heidelberg.

These reports will seek to summarize conditions and tendencies as to these questions throughout the world, and will be based on replies received from the various nations in response to a questionnaire that has been prepared on each topic. It is planned, further, to hold a meeting of the Commission at Munich, in the summer of 1915, and a final meeting in connection with the Sixth International Congress of Mathematicians at Stockholm, in 1916.

It is to be noted that the term "secondary instruction," as used in the foregoing announcement, refers to instruction given in the last two years of schools like the German *gymnasia*, and would be comparable in the United States to the fifth and sixth year in a six-year high school or to the freshmen and sophomore courses in our colleges. The chief interest to us in this report will be its bearing upon the general question as to whether it would be desirable to teach the elements of the calculus much earlier than we do, for instance, in connection with college algebra and analytic geometry.

Dr. H. F. Baker's presidential address before the mathematical and physical science section of the British Association for the Advancement of Science, was entitled "The Place of Pure Mathematics." It is published in full in *Science* of September 12, 1913. In the course of the introduction he says: "What, then, is this subject? What can it be about if it is not primarily directed to the discussion of the laws of natural phenomena? What kind of things are they that can occupy alone the thoughts of a life-time? I propose now to attempt to answer this, most inadequately, by a bare recital of some of the broader issues of present interest."

Under "Precision of Definitions" Dr. Baker points out that "it is a constantly recurring need of science to reconsider the exact implication of the terms employed," and illustrates this by reference to "those series which Fourier used so boldly, and so wickedly, for the conduction of heat." "Like all discoverers, he took much for granted. Precisely how much is the problem. This problem

has led to the precision of what is meant by a function of real variables, to the question of the uniform convergence of an infinite series, as you may see in early papers of Stokes, to new formulation of the conditions of integration and of the properties of multiple integrals, and so on. And it remains still incompletely solved."

Dr. Baker then refers to the calculus of variations, and is led to speak of the stability of the solar system. "For those who can make pronouncements in regard to this I have a feeling of envy; for their methods, as yet, I have quite another feeling. The interest of this problem alone is sufficient to justify the craving of a pure mathematician for powerful methods and unexceptionable rigor." He then proceeds to philosophical considerations on non-euclidean geometry, the theory of groups, algebraic functions, functions of complex variables, and the theory of numbers. "Each of those I have named is large enough for one man's thought; but they are interwoven and interlaced in indissoluble fashion and form one mighty whole, so that to be ignorant of one is to be weaker in all. I am not concerned to depreciate other pursuits, which seem at first sight more practical; I wish only, indeed, as we all do, it were possible for one man to cover the whole field of scientific research; and I vigorously resent the suggestion that those who follow these studies are less careful than others of the urgent needs of our national life."

The "southerly deviation of falling bodies" has recently been re-examined mathematically by three Americans. Dr. W. H. ROEVER, of Washington University, has contributed articles to the *Transactions* of the Amer. Math. Soc. (Vol. 12, 1911, 335–353; Vol. 13, 1912, 469–490), in which under the assumption of a distribution of revolution; that is, assuming the potential function of the earth's gravitational field of force to be of the form $f(r, z)$, where r is the distance of a general point from the earth's axis of rotation and z is that from a fixed plane perpendicular to the axis, he obtains a formula for the southerly deviation which reduces, when g is taken constant, to the formula given by Gauss. Roever showed also that local irregularities in the earth's gravitational field of force caused by mountains and mineral deposits may influence the southerly deviation to the extent of from -16 times to $+40$ times the amount which is given by the formula of Gauss for the southerly deviation.

The theory of the problem of the southerly deviation is reconsidered by President R. S. Woodward of the Carnegie Institution (*Astronomical Journal*, Vol. 28, 1913, 17–29; *Science*, N. S., Vol. 38, 1913, 315–319), who asserts that the problem has "hitherto been inadequately treated by reason of neglect of the effect of the square of the angular velocity of the earth and other terms of the same order, and by equal neglect of the effect of difference between the geocentric latitude of the point of departure of the body and the geographical latitude of the horizontal plane to which the body falls. Failure to consider these effects has led to erroneous conclusions in respect to the meridional deviation of the body, the real deviation being, in fact, opposite to that derived by Gauss and most later investigators." According to Woodward's deductions, "for a fall of

10 seconds, or 490.24 meters (in vacuo) in latitude 45°, the meridional deviation would be 3.03 cm. and the easterly deviation 16.85 cm." Most experiments carried on in the northern hemisphere have shown a very slight deviation, not to the north, as Woodward's formula demands, but toward the south. Says Woodward, "I consider it quite impractical to make any conclusive experiments on the deviation of spheres falling in air."

A third treatment of freely falling bodies was presented on October 25, 1913, by Professor L. M. HOSKINS, of Stanford University, before the San Francisco section of the American Mathematical Society. According to the abstract of the paper, Professor Hoskins referred the motion, as one of the simplest methods of studying the problem, "to axes fixed in the earth, making use of the relation between the accelerations of a particle referred to fixed and moving axes. . . . The question whether this field would cause a deviation northward or southward from a plumb-line suspended from the point where the body starts, is closely connected with the question of the curvature of the lines of force in this field; the path would lie on the convex side of that line of force passing through the position of rest, while the plumb-line would hang on the concave side. So far as the effect of this field is concerned, the body will fall on that side of the plumb-line toward which the lines of force are convex. Analysis indicates that the convexity is toward the equator."

This issue brings to a close the first year of the MONTHLY under its new auspices. The question whether a journal devoted primarily to the collegiate field of mathematics would be appreciated and supported has been answered in the affirmative to a gratifying extent. The subscription list has increased continuously throughout the year, the acceleration being greatest during the past three months. There seems to be every indication that this condition will continue and that the MONTHLY may, within another year, become self-sustaining, even at the very low subscription price at which it is offered and with the very high degree of mechanical excellence at which it is maintained.

All present subscribers will materially contribute to the cause by promptly sending their renewals to the Treasurer without waiting for a bill from him. A renewal blank is enclosed with this issue. In the case of all renewals received before January 5, 1914, acknowledgment will be indicated by the date on the address label of the January issue.

MANAGING EDITOR.

Errata. In addition to the corrections noted on pages 104, 210, 258, the word *k-triple* in line 7 of Professor Dickson's article on page 84 should read *k-tuple*. Also in the second note on page 292, the name should be T. N. HAUN.